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ANGELES
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509.73
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CONTRIBUTIONS IN SCIENCE

NUMBER 101

MAY 5, 1966

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ABSTRACT: A recently discovered marine deposit, of presumably late Miocene age, at Laguna Hills, California, has yielded an avifauna of eight or more species. One of these is described as a new genus and species of flightless "auk," family Mancallidae. The wing bones of the new form are less modified for swimming than are those of typical *Mancalla* and suggest an earlier evolutionary stage of development.

The development of the senior citizens' town of "Leisure World" in Laguna Hills, near El Toro, Orange County, California, has brought to light several fossil-bearing deposits of possibly two epochs of Tertiary age. Two sites have yielded a number of bones of the flightless auk, *Mancalla*, previously recorded only from the Pliocene. At a nearby site, however, *Mancalla*, is absent and is replaced by a related form of the same family (Mancallidae) in which the wings were less markedly specialized as paddles. This site (Los Angeles County Museum of Natural History locality no. 1945) has yielded a large vertebrate fauna including quantities of shark teeth, together with bones of marine mammals and over a hundred identifiable bones of birds. The presence of desmostylians among the marine mammals suggests Miocene age for this locality; Mitchell and Repenning (1963) show that all North American recoveries of this group of sea mammals have been from Miocene strata. Initial judgment of the shark fauna, by Dr. Shelton P. Applegate of the Los Angeles County Museum of Natural History suggests a late Miocene age (oral communication).

The bird bones at locality 1945 are fragmentary, with no evidence of associated elements. They are well petrified and of an even texture; the color varies, some bones being very dark brown, others lighter gray-brown. Some are smooth of contour as if slightly water worn. Preservation is in contrast to the rough-textured, discolored bones of *Mancalla* found at the other Laguna Hills sites. The matrix is sand and conglomerate, which, for the most part, is readily removable from the bones. On a few specimens, a very hard, adhering matrix suggests an original concretionary deposition.

Five wing and shoulder bone fragments and a portion of lower mandible represent the mancallid. The rest of the avifauna comprises seven or more species allocated to five families. Detailed identifications are yet to be made, but none of the bones is assignable to species living today. On the whole, the avifauna is oceanic, made up of the kinds of birds usually found in open ocean or on rocky

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shores, including shearwaters (family Procellariidae), boobies (family Suidae), and auklets (family Alcidae). One fragment of lower mandible, bearing two bony toothlike projections, is assigned to the extinct family of marine birds, the Pseudodontornithidae, and is presumably of the genus *Osteodontornis*, described (Howard, 1957) from the Miocene of Santa Barbara County, California. Two bones suggest a large goose—the only species that cannot be classed as typically oceanic.

The present study is directed to a careful analysis of the mancallid bones, and has resulted in the description of a new genus and species. Comparisons of the new form have been made with Los Angeles County Museum of Natural History (LACM) specimens of *Mancalla* from the Pliocene of Corona del Mar (Orange County) and San Diego, California. Specimens from the latter locality were also kindly loaned by the University of California, Los Angeles (UCLA) and the University's Museum of Paleontology on the Berkeley campus (UCMP). Unfortunately the type humerus of *Mancalla californiensis* from Los Angeles (and the only specimen from that locality) is lacking the distal condyles which characterize the specimen from Laguna Hills. Except for the area of the ectepicondylar process of the humerus, this element, and the lower mandible, can be compared only with specimens from San Diego. The other elements (carpometacarpus, coracoid and scapula) can be compared with both San Diego and Corona del Mar specimens. Several elements of the flightless Great Auk, *Pinguinis impennis*, in the collection of the Los Angeles County Museum of Natural History have also been available for comparison. The humerus from Laguna Hills is selected as the type of the new form.

DESCRIPTION

The new genus, described below, is assignable to the family Mancallidae on the basis of the following characters: humerus with ectepicondylar process extending high above distal condyles in straight line with shaft and closely appressed thereto, shaft straight (longitudinally) on anconal surface above distal end, distal end diagonally compressed in lateral direction so that external condyle tends to overlap internal condyle and internal and median tricipital crests are more developed than external; external condyle blunt and knoblike at its proximal termination, with greatest palmar projection at this point; carpometacarpus with long, straight process of metacarpal 1, facet for alar digit 1 relatively small, trochlear area flat proximoanteriorly, narrowing posterodistally, and of short extent proximally beyond the process of metacarpal 1.

Although these characters are associated with a specialization of the wing for swimming rather than for flight, they are not found in *Pinguinis*, the flightless auk of the family Alcidae. In the latter, both humerus and carpometacarpus closely resemble these elements in other alcids. The distal end of the humerus is typically alcid with the greatest palmar projection of the external condyle below its proximal tip, the tip itself attenuated, the shaft and distal condyles bending palmad to an even greater degree than in *Uria*. The process of meta-

carpal 1 of the carpometacarpus of *Pinguinis* is slightly lengthened, but has the convex anterior contour of *Uria*, and the trochlea is broad with centrally depressed surface as in all alcids.

***Praemancalla*, new genus**

Type: Praemancalla lagunensis, new species.

Diagnosis: See species diagnosis.

***Praemancalla lagunensis*, new species**

Figure 1 (A, C, D, E, G)

Type: Distal end of right humerus, LACM 15288; collected by M. K. Hammer, December, 1964.

Locality and Age: LACM locality no. 1945, Laguna Hills, 1¾ miles southwest of town of El Toro, in the SW/4 of NE/4 of SW/4, Sec. 34, T 6 S, R 8 W, Orange County, California; San Juan Capistrano quadrangle. Late Miocene?

Paratype: Proximal half of right carpometacarpus, LACM 15287; collected by W. Earl Calhoun, January, 1965, at type locality.

Diagnosis: Humerus: ectepicondylar process separated at its base from external condyle; compression of distal end less marked than in *Mancalla*, tri-cipital grooves less deeply incised and tricipital crests less prominent, more rounded, with internal crest less distally extended and bending slightly mediad; on palmar surface impression of brachialis anticus muscle faintly impressed, running diagonally from ectepicondylar process to a point slightly proximal to attachment of anterior articular ligament; area between impression and external condyle smooth, lacking the papilla at tip of external condyle found in *Mancalla*; shaft rounded, less deep than in *Mancalla*, breadth 66 per cent of depth.

Carpometacarpus: length of process of metacarpal 1, 117% of depth of proximal end of element (measured through internal crest of trochlea and process of metacarpal 1), with less than half of process distal to level of proximal symphysis; internal surface of carpal area with small, blunt pisiform process; trochlear area with narrow, deep groove between internal and external crests posteriorly; metacarpal 2 relatively broad, with more rounded anterior contour and more angular internal contour than in *Mancalla*.

Referred Material: Fragment of upper end of carpometacarpus, LACM 15290; incomplete upper end of right coracoid, LACM 15289; articular end of scapula, LACM 15294; articular portion of lower mandible, LACM 15428. All are from type locality.

Description of referred material: In carpometacarpus 15290 the small portion of metacarpal 3 that is preserved adjacent to the proximal symphysis curves away from metacarpal 2 to a greater extent than in *Mancalla*, with the internal surface of the symphyseal area distinctly depressed. This portion of the

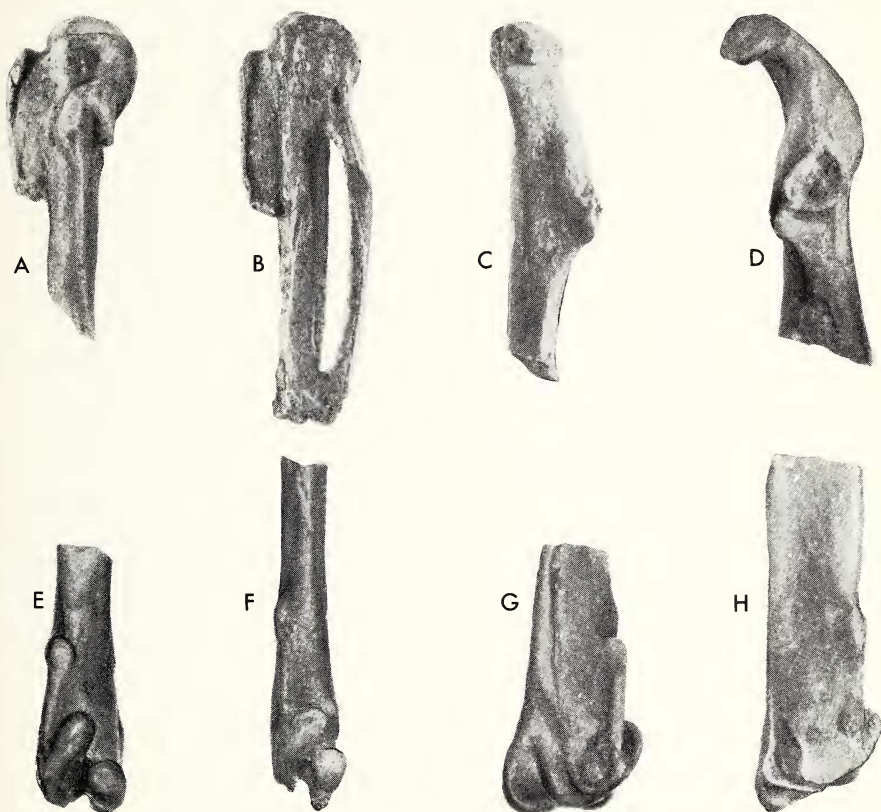


Figure 1. A, C, D, E and G, *Praemancalla lagunensis*: A, paratype carpometacarpus, LACM 15287, internal view; C, D, coracoid, LACM 15289, internal and dorsal views; E, G, type humerus, LACM 15288, palmar and external views. B, F and H, *Mancalla californiensis*? from San Diego: B, carpometacarpus, LACM 2541, internal view; F, H, humerus LACM 2296, palmar and external views. x 1½

element is broken away in the paratype carpometacarpus of *Praemancalla*; other portions of the referred specimen are similar to the paratype insofar as they are preserved. The coracoid resembles that of *Mancalla* in having a glenoid facet that is convex and a coracohumeral surface that is slightly twisted anteriorly at its upper end, but both areas are heavier; the scapular facet is larger and more cupshaped; the triosseal canal faces internally, contrasting with the posterointernal direction of the canal in *Mancalla*; the furcular facet is

broken, but is seemingly flatter proximally and more extended internally than in *Mancalla*. The scapula is poorly preserved, but is basically similar in contour to that of *Mancalla*, with relatively wide glenoid facet, and small, papillalike coracoidal facet continuous with it; the blade is thick, with the ventral surface tending to be concave, but less markedly so than in *Mancalla*. The articular portion of the lower mandible is massive, as in *Mancalla*, with a broad, straight-sided internal articular process projecting more posteriorly than in the Alcidae, but slightly more laterally than in *Mancalla*; ventrally, the ramus is less sharply angled than in *Mancalla*, and posteriorly the surface is less deeply depressed.

Measurements: See tables 1 and 2 for humerus and carpometacarpus compared with these elements of *Mancalla* and *Pinguinis*. Coracoid: distance from head to below scapular facet, 18.3 mm.; least breadth of coracohumeral surface, 4.7 mm.; breadth across triosseal canal, 5.9 mm. Lower mandible: posterior breadth from external articular facet to internal articular process, 10.5 mm.; distance from anteriormost edge of internal lip of articular area to posteriormost tip of internal articular process, 11.5 mm.; greatest depth of ramus externally, 8.4 mm. Scapula: approximate breadth across proximal end (tip of acromion broken), 13.0 mm.; dimensions of blade, 2.6 x 6.2 mm.

Remarks: In general size the available elements of *Praemancalla lagunensis* are comparable to specimens of *Mancalla* from the Pliocene of Corona del Mar and to the largest of those from San Diego, which, in turn, seemingly represent birds of the approximate dimensions of *Mancalla californiensis* and have been, at least tentatively, referred to that species. A reevaluation study of Pliocene *Mancalla*, now under way, based on material available since the 1949 report of Miller and Howard, and including collections from new localities as

TABLE 1
Measurements and Proportions of Humerus
Praemancalla lagunensis compared with *Mancalla californiensis*
and *Pinguinis impennis*
(Measurements in millimeters, proportions in per cent)

	<i>Praemancalla</i> Type	<i>Mancalla</i> ¹ (9 specimens)	<i>Pinguinis</i> (2 specimens)
Breadth of distal end	7.8	6.5 - 8.0	10.3 - 10.8
Depth of distal end, internally	10.5	9.6 - 11.2	12.1 - 12.4
Distance from top of ectepicondylar process to distal extremity, externally	15.3	15.5 - 19.8	16.2 - 16.3
Breadth of shaft immediately above ectepicondylar process	5.1	4.1 - 5.2	5.8 - 6.1
Depth of shaft immediately above ectepicondylar process	7.7	8.2 - 10.5	10.4 - 11.0
Ratio of breadth to depth of distal end	74.3	62.5 - 72.6	83.1 - 88.5
Ratio of breadth to depth of shaft	66.0	47.7 - 51.1	52.7 - 58.5

¹Ten largest specimens from San Diego: LACM 2304, 2480, 2481 (2 bones), 2670, 2695, 6180; UCMP 45856 (2 bones); specific assignment tentative.

TABLE 2
Measurements and Proportions of Carpometacarpus
Praemancalla lagunensis compared with *Mancalla californiensis*
and *Pinguinis impennis*
(Measurements in millimeters, proportions in per cent)

	<i>Praemancalla</i> Paratype	referred	Corona del Mar ¹	<i>Mancalla</i> San Diego ²	<i>Pinguinis</i> (2 specimens)
Length of process of metacarpal 1	14.0	14.1	16.6- 17.7	15.1- 15.4	12.3 13.0
Depth of proximal end through process of M 1 and internal trochlear crest	11.9	—	11.0- 11.8	10.5- 11.0	13.9 14.1
Breadth of trochlea, proximally	5.2	5.0	4.8- 5.1	4.6- 4.7	6.2 6.5
Breadth of shaft of metacarpal 2	4.7	4.0	3.1- 3.7	3.5- 3.6	4.5 4.8
Depth of shaft of metacarpal 2	4.5	4.2	4.7- 4.8	4.6- 4.8	4.9 5.3
Ratio of length of process of M 1 to depth of proximal end	117.2	—	145.2-159.0	137.0-142.2	87.3 93.5
Ratio of breadth of trochlea to depth of proximal end	43.6	—	42.6- 43.6	42.3- 43.7	44.6 46.1
Ratio of breadth to depth of shaft of metacarpal 2	95.7	95.2	65.4- 78.3	75.4- 78.3	91.8 90.6

¹Three specimens: LACM 2578, 2033, 2583.

²Three largest specimens, LACM 2541, 2542; UCMP 45861; specific assignment tentative.

well as from sites previously recorded, suggests that at least three species of Pliocene *Mancalla* should now be recognized. The diagnostic features of the Laguna Hills *Praemancalla lagunensis* markedly separate it from all of the Pliocene populations, and justify its assignment to a distinct genus. Although the wing bones of *Praemancalla* show distinct specialization toward a paddle-like wing, they are less advanced in this specialization than those of *Mancalla*. The carpometacarpus in the latter genus lacks the pisiform process, has an even longer process of metacarpal 1 than in *Praemancalla*, with 50% or more extending distad to the proximal symphysis, and the entire element is more compressed, with the posterior division between the external and internal crests of the trochlea less distinctly grooved. The humerus of *Mancalla* is also more compressed, the shaft deep and bladelike, the tricipital crests and grooves more sharply and deeply developed (respectively). The degree of development of the wing of *Praemancalla* suggests a stage of evolution that might well be looked for in the ancestors of the Pliocene *Mancalla*. It seems not unreasonable to look upon *Praemancalla* as exactly what its name implies, a form anticipating *Mancalla*. These evolutionary implications of the new genus, therefore, afford contributing evidence for a late Miocene age for Laguna Hills locality LACM no. 1945.

ACKNOWLEDGMENTS

The material from Laguna Hills has been acquired largely through the interest and generosity of persons in that area who have kept the museum informed as excavations opened up, and have themselves made collections for the museum. I should like, in particular, to acknowledge the aid of Mr. W. Earl Calhoun, of Fullerton, California.

Specimens illustrated were photographed by George Brauer, and expertly retouched by Pearl Hanback to bring out detail which in these darkened specimens is very difficult to show photographically. My continuing thanks go to the John Simon Guggenheim Memorial Foundation. This study is an outgrowth of a project sponsored by the Foundation under a research grant of 1962-63 for investigation of avian fossils of western United States. The illustrations were financed from this grant.

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